

FINAL DRAFT
MAY 2 1992

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

Proposed Advisory Circular 91-53A, Noise Abatement Departure Profiles

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Request for comments on proposed advisory circular

SUMMARY: The Federal Aviation Administration (FAA) is proposing to issue an advisory circular designed to standardize the noise abatement departure profiles for all types of subsonic turbojet-powered airplanes, with a maximum certificated weight of more than 75,000 pounds, operating to or from an airport in the 48 contiguous United States and the District of Columbia.

The proposed advisory circular would revise Advisory Circular 91-53, Noise Abatement Departure Profile, issued in October 1978. The proposal reflects FAA's continuing effort to enhance safety of flight operations through standardization while providing effective noise relief to communities. To achieve this objective, the FAA proposes a means, but not the only means, of avoiding proliferation of noise abatement profiles tailored for unique airport/community environments.

The current Advisory Circular 91-53 provides for one standard noise abatement departure profile, which is most effective in providing relief for noise sensitive areas some distance from the airport. The revised proposal recommends two noise abatement departure profiles, one "close-in" and one "distant", be adopted as standard for nationwide use for each airplane type as determined by each airplane operator. It is recommended that no more than two noise abatement departure profiles be used by each airplane operator for each airplane type to minimize the number of profiles and thus benefit

airplane operators and pilots. Standardization of operational profiles and flight crew training enhances safety.

DATES: Comments must be received on or before xxxxxxxx, 1992.

ADDRESS: Send all comments on this proposed AC to: Federal Aviation Administration, Attn: AFS-435, 800 Independence Ave., SW, Washington, D.C. 20591. Comments may be inspected at the above address between 8:30 A.M. and 4:30 P.M. weekdays, except federal holidays.

FOR FURTHER INFORMATION CONTACT: Mr. Wesley Te Winkle, Flight Standards Service, at the above address; telephone (202) 267-3728.

SUPPLEMENTARY INFORMATION:

COMMENTS INVITED:

A copy of the proposed AC is attached or may be obtained by contacting the person named above under "FOR FURTHER INFORMATION CONTACT." Interested persons are invited to comment on the proposed AC by submitting such written data, views, or arguments as they desire. Commenters should identify AC91-53A and submit comments in duplicate to the address specified above. All communications received on or before the closing date for comments will be considered by the Flight Standards Staff before issuing the final AC.

BACKGROUND:

The Secretary of Transportation and the FAA Administrator created a Departmental Task Force on FAA Reform to recommend improvements that could be made in the operations within the FAA itself and between the FAA and the Office of the Secretary. A subgroup of the Task Force was specifically directed to recommend improvements in the rulemaking process concerning safety issues. That subgroup proposed to establish

an advisory committee as a forum for the FAA to obtain input from outside the Government on major regulatory issues facing the agency.

The Secretary approved the proposal to establish an advisory committee, and the Aviation Rulemaking Advisory Committee (ARAC) was chartered in February 1991. The committee is to provide advice and recommendations to the Administrator, through the Associate Administrator for Regulation and Certification and the Director of Rulemaking, concerning the full range of the FAA's rulemaking activity with respect to safety-related issues, such as air carrier operations, aircraft certification, airports, and noise. The committee affords the FAA additional opportunities to obtain information and insight directly from the substantially affected interests meeting together and exchanging ideas on proposed or existing rules and other operational procedures that should be revised or eliminated. This will result in the development of better rules and operational procedures in less time and is intended to require fewer FAA resources than under the current practice. The activities of the committee are designed to facilitate but not circumvent the normal coordination process or the public rulemaking procedures. All communications between the FAA and the committee on any particular issue and an assessment of the effect of those communications on the development of proposed rules will be disclosed fully in the public docket.

The Aviation Rulemaking Advisory Committee is composed of approximately 60 members and has sufficient diversity to ensure the requisite range of views and expertise necessary to discharge its responsibilities. The membership of the committee is balanced fairly in points of view representative of the aviation community and

affected non-aviation interests and includes air carriers, manufacturers, general aviation representatives, airport operators, labor groups, environmental groups, universities, corporations, associations, and passenger groups.

One of the initial subcommittees established under the ARAC was the Air Carrier Operations Subcommittee. One of the initial safety-related procedures that surfaced in an early meeting of the Subcommittee was the lack of standardization in noise abatement departure profiles. Although some work had been accomplished on this issue, the task for resolving the problem of nonstandard noise abatement departure profiles was formally assigned to a working group, appropriately named the ~~Noise~~ Abatement Takeoff Profile Working Group. Within this group were the representatives of various affected aviation interests.

As the working group began its task, a number of related problems surfaced. One problem was that, because of unique runway/community situations and varying performance and noise characteristics of different airplanes, pressures to use nonstandard or special noise abatement takeoff profiles have been increasing. A second problem was that the lack of standardization and any proliferation of airport specific vertical departure profiles may conflict with the high degree of public safety demanded of aviation. Although a nonstandard profile may not have a significant effect when considered alone, a plethora of profiles varying from airport to airport and airplane to airplane would tend to derogate safety.

On August 12, 1991, the working group formally presented its recommendations to the subcommittee in a public hearing, and the

recommendations were forwarded to the FAA Administrator for acceptance. The FAA accepted the following:

- 1) The minimum performance criteria established by the working group (draft AC) should be incorporated in an advisory circular.
- 2) The guidelines established for selection of noise abatement takeoff profiles should be formalized.
- 3) In the interest of ensuring an orderly transition in the adoption of the performance criteria described in recommendation #1, it is recommended that the FAA implement subsequent takeoff noise abatement profiles through Operations Specifications at an appropriate time. In addition, at airports where current airplane operations are not compatible with the performance criteria in recommendation #1, it is recommended that the FAA coordinate appropriate agreements and arrangements with the affected airports and, if appropriate, the affected airplane operators.
- 4) Although some preliminary noise assessments have been accomplished with data from a B737-300 simulator, more work is needed to ensure that a process is available to assess whether any proposed takeoff profile does in fact offer sufficient noise abatement to justify its use. Accordingly, assessments of which departure profile is preferable from environmental standpoints, including noise abatement and energy conservation, require consideration of airplane type and the variety of airport conditions including the

locations of affected noise sensitive areas. In the interest of developing a method and data base for assessing the community noise benefit (or non-benefit) of the noise abatement takeoff profiles, it is recommended that the FAA establish a working group to accomplish this activity.

The submission and acceptance of these recommendations completed the work of the Noise Abatement Takeoff Profile Working Group and it was disbanded. Subsequently, the FAA authorized the subcommittee to form an Airport Noise Assessment Working Group to evaluate the noise impact relating to proposed noise abatement departure profiles and other factors.

The acceptance of a limitation to no more than two basic noise abatement departure profiles per airplane type for each airplane operator, applicable to all types of subsonic turbojet-powered airplanes with a maximum certificated weight of more than 75,000 pounds, would assure standardization of flight crew procedures and training. The two noise abatement departure profiles, a close-in and a distant profile, would be adopted as standard guidelines for nationwide use for each airplane type, as determined by each airplane operator. The profile selected for a particular runway situation would depend on the location of the noise sensitive areas.

Using a minimum altitude of 800 feet above field elevation to initiate noise abatement thrust reduction would provide for reasonable flight crew workloads to achieve a stable flight profile during a critical workload period in a high density traffic area. It would also provide a safety margin in altitude should unexpected wind-shear,

wake turbulence or other adverse weather conditions be encountered after the thrust reduction or configuration change is initiated.

A minimum allowable thrust level would ensure a positive rate of climb in the event of an engine failure, without pilot intervention. This minimum level also would provide sufficient thrust margins to permit normal maneuvering after a thrust reduction, thereby reducing flight crew workloads associated with a pitch-over to an acceptable airplane attitude.

In summary, following the procedures set forth in the proposed Advisory Circular would enhance safety, standardize departure profiles, and address the noise associated with airplane operations nationwide. Additionally, these proposed departure profiles would serve as a reference for operational testing to be completed in 1992. Issued in Washington, D.C. on xxxxxxxxxx 1992

Thomas C. Accardi

DRAFT AC 91-53A

NOISE ABATEMENT DEPARTURE PROFILES

[Draft Revised

1992]

1. **PURPOSE.** This Advisory Circular (AC) describes acceptable criteria for safe noise abatement departure profiles for subsonic turbojet-powered airplanes with a maximum certified gross takeoff weight of more than 75,000 pounds. These departure profiles are consistent with the airworthiness standards required by Federal Aviation Regulations (FAR) Part 25 for type certification and FAR Part 91 for general aircraft operations. This AC also provides a technical analysis and description of typical departure profiles that are consistent with the Federal Aviation Administration's (FAA) safety responsibilities and have the potential to minimize the airplane noise impact on communities surrounding airports.

2. **REVISION.** AC91-53 is revised by this publication.

3. **RELATED READING MATERIAL.** Federal Aviation Regulations Parts 25, 91, and 121.

4. **BACKGROUND.**

a. For several years, the FAA has worked to develop and standardize profiles to minimize airplane noise. As part of that commitment, the FAA has worked with airport managers, airplane operators, pilots, special interest groups and federal, state, and local agencies in numerous programs for evaluating noise levels in the airport environment. The research considered a variety of departure flight tracks and profiles.

b. From an environmental standpoint, avoiding noise sensitive areas by using preferential noise abatement runways and flight tracks

whenever possible can effectively supplement a comprehensive noise abatement program. The FAA believes that using the two noise abatement departure profiles described in this advisory circular for subsonic turbojet-powered airplanes can provide environmental benefits to the airport communities. The profiles outline acceptable criteria for speed, thrust settings and airplane configurations used in connection with noise abatement departure profiles. These noise abatement departure profiles can be combined with preferential runway selection and flight path techniques to minimize noise impact.

c. FAA reviews of various airplane vertical noise abatement profiles indicate that some intricate noise abatement departure profiles have been developed on an airport specific basis. The management of these intricate profiles could compromise the pilot's attention to interior flight deck details, traffic avoidance, and other safety responsibilities.

5. **COMMENTS INVITED.** Comments regarding this publication should be directed to:

Attn: AFS-400

Federal Aviation Administration

800 Independence Avenue, S.W.

Washington DC 20591

Comments received will not necessarily be acknowledged but will be considered in the development of upcoming revisions to ACs or other related technical material.

6. DEFINITIONS.

- a. NADP: Noise Abatement Departure Profile
- b. CLOSE-IN COMMUNITY NADPs: NADPs for individual airplane types intended to provide noise reduction for noise sensitive areas located in close proximity to the departure end of an airport runway.
- c. DISTANT COMMUNITY NADPs: NADPs for individual airplane types intended to provide noise reduction for all other noise sensitive areas.
- d. AFE: Above field elevation.

7. NOISE ABATEMENT DEPARTURE PROFILES (NADPs). Acceptable criteria have been established for two types of NADPs for each airplane type, as defined by each airplane operator. These departure profiles are applicable to all types of subsonic turbojet-powered airplanes over 75,000 pounds gross takeoff weight. The two types of NADPs are the "close-in" and "distant" profiles as described below.

a. CLOSE-IN NADP.

- (1) Initiate thrust cutback at an altitude of no less than 800 feet AFE and prior to initiation of flaps or slats retraction.
- (2) For airplanes without an operational automatic thrust restoration system, achieve and maintain no less than the thrust level necessary after thrust reduction to maintain, for the flaps/slats configuration of the airplane, the takeoff path engine-inoperative climb gradients specified in FAR 25.111(c)(3) in the event of an engine failure.

- (3) For airplanes with an operational automatic thrust restoration system, achieve and maintain no less than the thrust level necessary after thrust reduction to maintain, for the flaps/slats configuration of the airplane, a takeoff path engine-inoperative climb gradient of 0%, provided that the automatic thrust restoration system will, at a minimum, restore sufficient thrust to maintain the takeoff path engine-inoperative climb gradients specified in FAR 25.111(c)(3) in the event of an engine failure.
- (4) During the thrust reduction, coordinate the pitchover rate and thrust reduction to provide a decrease in pitch consistent with allowing indicated airspeed to decay to no more than 5 knots below the all-engine target climb speed, and in no case to less than V_2 for the airplane configuration.
- (5) Maintain the speed and thrust criteria described in steps 7a(2) through (4) to 3,000 feet AFE or above, or until the airplane has been fully transitioned to the en route climb configuration (whichever occurs first), then transition to normal en route climb procedures.

b. **DISTANT NADP.**

- (1) Initiate flaps/slats retraction prior to thrust cutback initiation. Thrust cutback is initiated at an altitude no less than 800 feet AFE.
- (2) For airplanes without an operational automatic thrust restoration system, achieve and maintain no less than

the thrust necessary after thrust reduction to maintain, for the flaps/slats configuration of the airplane, the takeoff path engine-inoperative climb gradients specified in FAR 25.111(c)(3) in the event of an engine failure.

- (3) For airplanes with an operation automatic thrust restoration system, achieve and maintain no less than the thrust level necessary after thrust reduction to maintain, for the flaps/slats configuration of the airplane, a takeoff path engine-inoperative climb gradient of 0%, provided that the automatic thrust restoration system will, at a minimum, restore sufficient thrust to maintain the takeoff path engine-inoperative climb gradients specified in FAR 25.111(c)(3) in the event of an engine failure.
- (4) During the thrust reduction, coordinate the pitchover rate and thrust reduction to provide a decrease in pitch consistent with allowing indicated airspeed to decay to no more than 5 knots below the all engine target climb speed, and in no case to less than V_2 for the airplane configuration.
- (5) Maintain the speed and thrust criteria as described in steps 7b(2) through (4) to 3,000 feet AFE or above, or until the airplane has been fully transitioned to the en route climb configuration (whichever occurs first), then transition to normal en route climb procedures.

8. OPERATIONAL GUIDELINES

- a. Each airplane operator may apply the procedures specified in this AC to determine the following for each of its airplane types:
 - (1) Close-in community noise abatement departure profile (NADP).
 - (2) Distant community noise abatement departure profile (NADP).
- b. Each airplane operator is encouraged to consult with the airport operator before determining the appropriate NADP for each airplane type and runway it will be using at that airport.
- c. For each NADP, the airplane operator shall specify the altitude above field elevation (AFE) at which thrust reduction from takeoff thrust or airplane configuration change, excluding gear retraction, is initiated.
- d. Each airplane operator should limit the number of noise abatement departure profiles for any airplane type at any one time to no more than two.
- e. This AC should not be construed to affect the responsibilities and authority of the pilot in command for the safe operation of the airplane.